

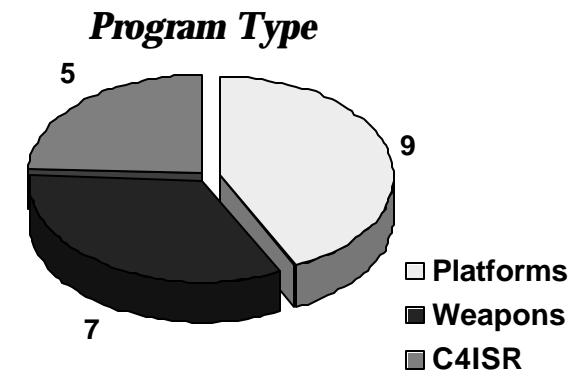
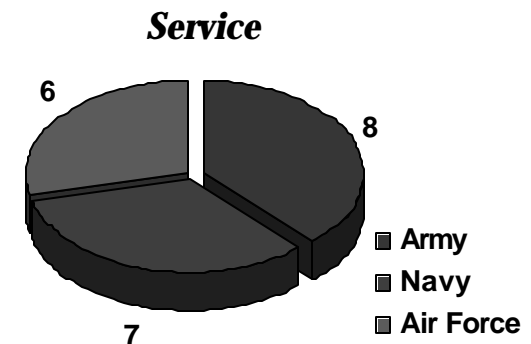
# Project Purpose

- **At the program level, obtain data concerning:**
  - types of M&S in use
  - how M&S are applied
  - who develops, owns & maintains M&S
  - how M&S are certified for use
  - the extent of programs' investment in M&S

***Rationale: DOT&E is trying to find ways to make more use of M&S. Additional information was needed.***

# Summary of Survey Respondents to Date

Program	Component	System Type	Current Status*	FRP Date*
Crusader	Army	Platform	MSII decision 2001	1QFY06
Comanche	Army	Platform	MSII decision FY02	1QFY07
M1A2 Upgrade	Army	Platform	FRP	3QFY94
ATACMS Bk II/BAT	Army	Weapon	LRIP	3QFY00
Javelin	Army	Weapon	FRP	3QFY97
SADARM	Army	Weapon	LRIP	4QFY98
FAAD C2	Army	C4ISR	FRP	3QFY95
C2 Vehicle	Army	C4ISR	LRIP	1QFY00
F/A-18 E/F	Navy	Platform	LRIP	3QFY00
V-22 Osprey	Navy/USMC	Platform	LRIP	2QFY00
LPD-17	Navy/USMC	Platform	EMD	3QFY07
AIM-9X	Navy	Weapon	LRIP	1QFY02
AN/BSY-2 (SSN-21)	Navy	C4ISR	Sea Trials on SSN-22 (USS <i>CONNECTICUT</i> )	N/A
UHF Follow-On	Navy	C4ISR	Completing FRP	4QFY88
SLAM-ER	Navy	Weapon	FRP	2QFY99
F-22	USAF	Platform	LRIP	3QFY03
B-2	USAF	Platform	IOC	N/A (did not enter FRP)
EELV	USAF	Platform	MSII Decision FY99	2QFY03 (MSIII decision 1QFY03)
ABL	USAF	Weapon	MSII decision FY03	2QFY05
SBIRS	USAF	C4ISR	MSII decision 1996	First GEO sat deliv. FY02; HEO FY03; LEO FY-04
SFW P3I	USAF	Weapon	FRP	3QFY96



Source: DOT&E FY98 Annual Report to Congress

## Summary of Findings

- **A large set of commonly used M&S exists**
  - Are they “best of breed?”
  - What is the upgrade strategy for these M&S?
  - Can greater commonality be developed?
- **Industry plays a predominant role in M&S development and ownership**
  - What is the impact of proprietary M&S
  - Corporate IR&D investments
- **Interpretation and implementation of VV&A varies widely**
- **Data on expenditures for M&S development and use is elusive**

# Additional Observations from Survey Responses

- **M&S development and use:**
  - M&S (HWIL/MITL) linked across platforms
  - Few affordability M&S reported in use
  - Few examples of M&S applied for test design
  - Little evidence of “system of systems” modeling (e.g., SBIRS)
- **M&S cost:**
  - Some cost savings identified (e.g., through use of HWIL)
  - Several programs include M&S efforts in contract but only one reported incentivizing the contractor

# Conclusions

- **M&S development is “here and now” oriented**
  - M&S support plans do not document future needs
  - Plans for M&S support of T&E and emerging DoD initiatives are unclear
- **Building a historically-based business case for M&S is daunting**
  - unavailability of cost data for M&S development and use
  - programs with strong M&S components may not be the leaders in schedule/cost performance and assessed operational effectiveness
- **Implementation of assumed Simulation-based Acquisition (SBA) enablers varies widely**
  - by Service
  - by program maturity
- **Quality of M&S support to system development and acquisition decision making needs review**
  - PMs may not have easy accessibility to robust M&S developed in S&T community
  - M&S suitability may be unknown or assumed

# **Recommendations for DOT&E Consideration**

- **Establish a working group to evaluate and prioritize HWIL and MITL investments**
- **Seek access to proprietary M&S related to T&E**
- **Explore increased use of M&S in operational test design and planning**
- **Determine what Simulation-based Acquisition should imply for T&E**
- **Participate in a review of DoD M&S investments**
  - size and scope
  - system of system requirements
  - infrastructure (HWIL/MITL)

# Backup Charts

# M&S Characterization

## Common M&S

- **Combat Models**

- ALARM (2)
- ASAP (2)
- CASTFOREM (2)
- SUPPRESSOR (4)
- TRAP (3)

- **Engineering/Design/  
Manufacturing**

- ANSYS (2)
- APART (2)
- CATIA (3)
- COVART (3)
- DYNA 2D (2)
- ESAMS (3)
- FASTGEN (3)
- JSEM (2)
- Pro-E (5)

- **Logistics**

- COMPASS (2)
- LCOM (2)
- RELEX (3)
- TIGER (2)

- **Environments**

- EOSAEL (2)
- LOWTRAN (5)
- MODTRAN (2)
- NASTRAN (5)
- PATRAN (5)
- SINDA (3)

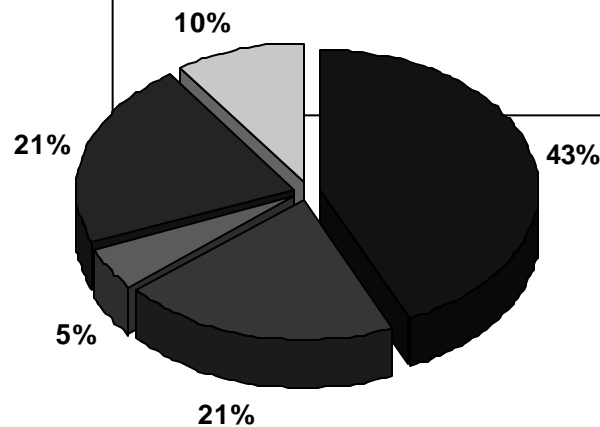
***Exploiting M&S commonality:***

- ***Best-of-breed?***
- ***Strengths/Weaknesses?***
- ***Limits on extension/application?***
- ***VV&A status?***



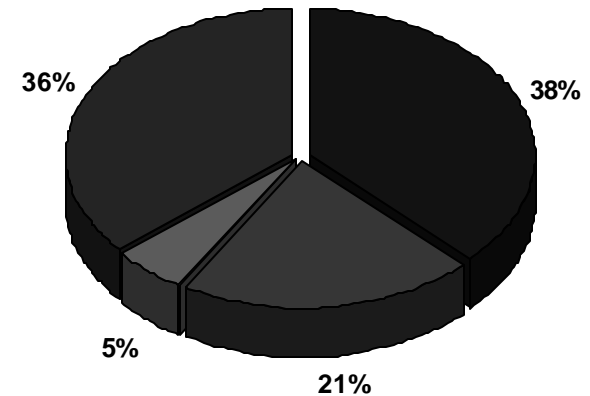
# M&S Management

## *Developers*



- 219 M&S from 13 programs
- Crusader, F/A-18E/F, Javelin, FAADC2, AIM-9X, ATACMS/BAT and Comanche did not provide data on M&S developers

## *Owners*

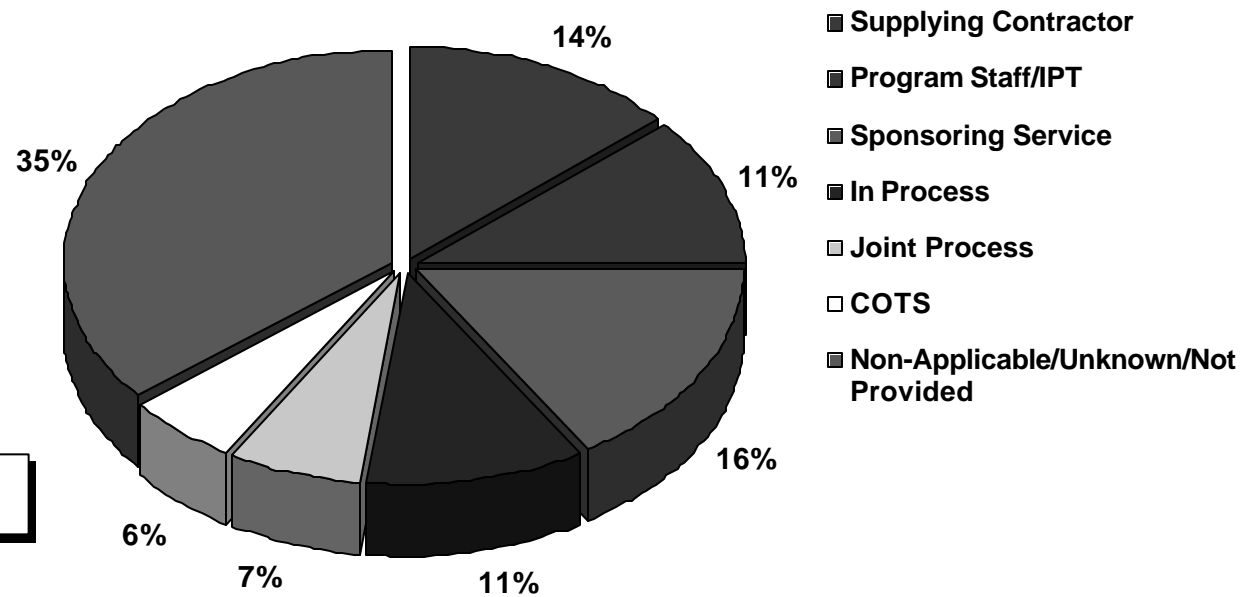


- 359 M&S

- ***Industry is the predominant developer/owner***
- ***Extent of industry involvement in Service/Government-developed M&S (30%) unknown***

# VV&A Overview

## Who Does VV&A?

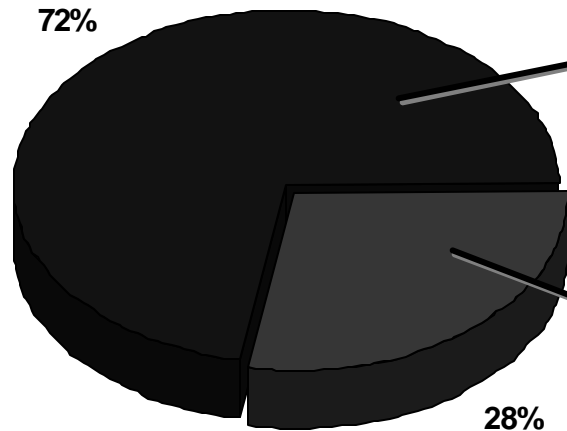


• 359 M&S

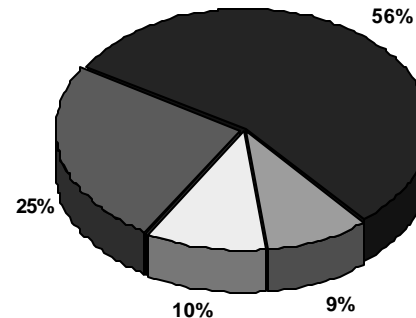
- ***Uncertainty about “pedigree” of M&S being used (35%)***
- ***Potential conflicts of interest (25%)***
- ***VV&A standards for COTS M&S?***
- ***Use of joint/independent processes low (7%)***

# M&S Cost Overview

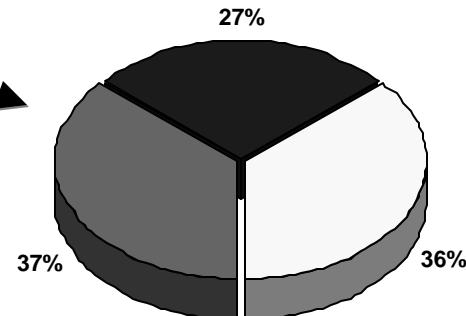
**% of M&S for which Cost Data was Provided**  
(359 Total)



- Cost Data Not Available
- Provided Cost Data



- Cost Unknown (Developed Outside Program)
- Cost Unknown (Proprietary to Contractor)
- Costs Unknown (Not Separable)
- No Information Provided



- Progs w/Data for 100% of M&S
- Progs w/Data for >40% of M&S
- Progs w/Data for <25% of M&S

- ***M&S development and application costs data are not readily available within acquisition programs***